What is claimed is:

1. A transcoder for converting an input CELP codec stream of one format into an output CELP codec stream of another format, comprising:

a decoding unit of an input CELP codec, which converts a bitstream encoded in an input CELP codec format into a speech signal;

a transcoding filter, which performs filtering of the speech signal decoded in the decoding unit of the input CELP codec with filter characteristics calculated by adapting an optimum weight to minimize spectral distortion on the basis of a reference filter;

a transcoding filter design unit, which extracts the optimum weight to minimize spectral distortion of the transcoding filter from a weight set, and then supplies the optimum weight to the transcoding filter; and

an encoding unit of an output CELP codec, which generates a bitstream in an output CELP codec format by encoding the speech signal filtered in the transcoding filter.

2. The transcoder of claim 1, wherein the transcoding filter is a perceptual weighting filter which uses the equation

$$H_{pwf}(z) = \frac{A(z/\gamma_1)}{A(z/\gamma_2)}$$

where $A(z) = 1 - \sum_{i=1}^{p} a_i \cdot z^{-1}$, p is a linear predictive coding (LPC) order, μ is a tilt factor, and γ_1 and γ_2 are weights of the perceptual weighting filter.

3. The transcoder of claim 1, wherein the transcoding filter design unit performs:

a procedure to generate the reference filter for evaluating the transcoding filter using characteristics of a perceptual weighting filter and post-filter of the input CELP codec and a perceptual weighting filter of the output CELP codec; and

on the basis of the reference filter, a procedure to evaluate a transcoding filter weight as an optimum weight when spectral distortion is minimum.

4. A transcoding method performed in the transcoder converting an input CELP codec stream of one format into an output CELP codec stream of another format, comprising:

(A) generating a transcoding filter, which has perceptual weighting filter characteristics, to which a weight minimizing a spectral distortion is applied;

(B) converting a bitstream encoded in an input CELP codec format into a speech signal;

(C) filtering a speech signal generated in step (B) with the transcoding filter generated in step (A); and

(D) generating a bitstream of an output CELP codec format by encoding the speech signal filtered in step (C).

5. The method of claim 4, wherein step (A) comprises:

(A1) generating a reference filter for evaluating the transcoding filter by using characteristics of a perceptual weighting filter and post-filter applied to the input CELP codec and of a perceptual weighting filter applied to the output CELP codec; and

(A2) on the basis of the reference filter, generating the transcoding filter, to which the weight minimizing the spectral distortion is applied, having the perceptual weighting filter characteristics.

6. The method of claim 5, wherein step (A1) comprises:

(A1_1a) extracting an LPC coefficient by decoding a bitstream encoded in the input CELP codec format;

(A1_2a) evaluating the perceptual weighting filter to be used in the output CELP codec by using the LPC coefficient obtained in step (A1_1a);

(A1_3a) evaluating, as a compensation filter, a post-filter for compensating the effect of the perceptual weighting filter used for generation of the bitstream encoded in the input CELP codec format; and

(A1_4a) evaluating the reference filter by connecting the compensation filter evaluated in step (A1_3a) and the perceptual weighting filter evaluated in step (A1_2a) in series.

7. The method of claim 5, wherein step (A1) comprises:

(A1_1b) extracting the LPC coefficient by decoding the bitstream encoded in the input CELP codec format;

(A1_2b) evaluating the perceptual weighting filter to be used in the output CELP codec by using the LPC coefficient obtained in step (A1_1b);

(A1_3b) evaluating, as the compensation filter, an inverse-filter for compensating the effect of the perceptual weighting filter used for generation of the bitstream encoded in the input CELP codec format; and

(A1_4b) evaluating the reference filter by connecting the compensation filter evaluated in step (A1_3b) and the perceptual weighting filter evaluated in step (A1_2b) in series.

8. A method of designing a transcoding filter of the transcoder which includes a decoding unit of an input CELP codec, which converts a bitstream encoded in an input CELP codec format into a speech signal, a transcoding filter which performs filtering of the converted speech signal with perceptual weighting filter characteristics, and an encoding unit of an output CELP codec, which generates a bitstream of an output CELP codec format by encoding the filtered speech signal, comprising:

(A) generating a reference filter by using characteristics of a perceptual weighting filter and post-filter applied to the input CELP codec and of the perceptual weighting filter applied to the output CELP codec;

(B) selecting an optimum weight which minimizes a spectral distortion of the transcoding filter from a pre-selected weight set on the basis of the reference filter; and

(C) generating the transcoding filter by applying the weight selected in step (B).

9. The method of claim 8, wherein step (A) comprises:

(A1_1a) extracting an LPC coefficient by decoding the bitstream encoded in the input CELP codec format;

(A1_2a) evaluating the perceptual weighting filter to be used in the output CELP codec by using the LPC coefficient obtained in step (A1_1a);

(A1_3a) evaluating, as a compensation filter, the post-filter for compensating the effect of the perceptual weighting filter used for generation of the bitstream encoded in the input CELP codec format; and

(A1_4a) evaluating the reference filter by connecting the compensation filter evaluated in step (A1_3a) and the perceptual weighting filter evaluated in step (A1_2a) in series.

10. The method of claim 8, wherein step (A) comprises:

(A1_1b) extracting the LPC coefficient by decoding the bitstream encoded in the input CELP codec format;

(A1_2b) evaluating the perceptual weighting filter to be used in the output CELP codec by using the LPC coefficient obtained in step (A1_1b);

(A1_3b) evaluating, as the compensation filter, an inverse-filter for compensating the effect of the perceptual weighting filter used for generation of the bitstream encoded in the input CELP codec format; and

(A1_4b) evaluating the reference filter by connecting the compensation filter evaluated in step (A1_3b) and the perceptual weighting filter evaluated in step (A1_2b) in series.

11. The method of claim 8, wherein step (B) comprises:

(B1) randomly selecting one weight pair from a weight set;

(B2) evaluating the transcoding filter by applying the selected weight pair to the transcoding filter having a perceptual weighting filter form;

(B3) calculating a frequency response of the transcoding filter evaluated in step (B2);

(B4) calculating a spectral distortion of the transcoding filter by comparing the frequency response of the reference filter with a frequency response calculated in step (B2);

(B5) calculating the spectral distortion corresponding to each weight pair by performing steps (B2) through (B4) for every weight pair from the weight set;

(B6) selecting a weight pair resulting in a minimum spectral distortion as the optimum weight pair.

12. The method of claim 9, wherein step (B) comprises:

(B1) randomly selecting one weight pair from a weight set;

(B2) evaluating the transcoding filter by applying the selected weight pair to the transcoding filter having a perceptual weighting filter form;

(B3) calculating a frequency response of the transcoding filter evaluated in step (B2);

(B4) calculating a spectral distortion of the transcoding filter by comparing the frequency response of the reference filter with a frequency response calculated in step (B2);

(B5) calculating the spectral distortion corresponding to each weight pair by performing steps (B2) through (B4) for every weight pair from the weight set;

(B6) selecting a weight pair resulting in a minimum spectral distortion as the optimum weight pair.

13. The method of claim 10, wherein step (B) comprises:

(B1) randomly selecting one weight pair from a weight set;

(B2) evaluating the transcoding filter by applying the selected weight pair to the transcoding filter having a perceptual weighting filter form;

(B3) calculating a frequency response of the transcoding filter evaluated in step (B2);

(B4) calculating a spectral distortion of the transcoding filter by comparing the frequency response of the reference filter with a frequency response calculated in step (B2);

(B5) calculating the spectral distortion corresponding to each weight pair by performing steps (B2) through (B4) for every weight pair from the weight set;

(B6) selecting a weight pair resulting in a minimum spectral distortion as the optimum weight pair.